10/086,274

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Term: L7 and dead end

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END OF SEARCH HISTORY

DOCUMENT-IDENTIFIER: US 6495041 B2
TITLE: Method for purifying aqueous suspension

Brief Summary Text (3):
The present invention relates to a method for purifying an aqueous suspension with a module comprising wavy hollow fiber membranes. Particularly, the present invention relates to a method for purifying an aqueous suspension, for example, tap water such as river water, lake water, marsh water and ground water; water for industrial use; waste water; secondary treatment waste water; industrial sewage; domestic sewage; human waste; sea water and the like with the module.

Brief Summary Text (6):
Heretofore, various methods for purifying aqueous suspensions such as tap water, water for industrial use, waste water, industrial sewage, domestic sewage, human waste, sea water and the like with a hollow fiber membrane have been known. In particular, a purifying method according to so-called external pressure filtration, in which raw water permeates in the direction from the outer to inner surface of a hollow fiber membrane, can secure a larger membrane area contributing to filtration per unit volume when compared to so-called internal pressure filtration, in which raw water permeates in the direction from the inner to outer surface of a hollow fiber membrane. Therefore external pressure filtration is advantageously used in the field wherein minimization of water production cost is required, for example, a water-treatment field such as turbidity removal for waterworks.

Brief Summary Text (9):
On the other hand, as a membrane which can be used for the above-mentioned purifying method, a reverse osmosis membrane, an ultrafiltration membrane, a microfiltration membrane, a gas separation membrane, a nanofilter, and a deairing membrane have been known. These membranes are not used alone but used in plural, i.e., in the form of a hollow fiber membrane module. The membrane module is prepared by mounting a plurality of the membranes in a module case, sealing at least one edge thereof with a thermosetting resin such as an epoxy resin, and cutting the bonded and fixed portion to open a hollow portion. Such a module is used in various fluid treatment fields, for instance, a reverse osmosis membrane module is used for desalination of sea water or brine, production of primary pure water of ultra-pure water, and concentration of fruit juice or milk; an ultrafiltration membrane module for collection of electrodeposition paints, production of pyrogen-free water, treatment of waste water, concentration of enzymes, final filtration of ultra-pure water, and turbidity removal from tap water or waste water; a microfiltration membrane module for turbidity removal from tap water or waste water, treatment of concentrated water, germ removal and purification of fermentation liquid, and fine particle removal from chemicals, a gas separation membrane module for steam removal, condensation of hydrogen, condensation or enrichment of oxygen, condensation or enrichment of nitrogen, and condensation of carbon dioxide; a nanofilter module for removal of agricultural chemicals or halogenated organic compounds; and a deairing membrane module for deairing of water and aqueous solution. The hollow fiber membranes per se have also been studied. For example, Japanese Patent Application Laid-Open No.64-22308 discloses the art using an external pressure filtration type hollow fiber membrane module wherein hollow fibers having wavy or spiral curls at least in a part thereof are mounted instead of the conventional straight hollow fiber membrane in order to prevent such a mutual clinging of the hollow fibers that hinders raw water from flowing toward the center of the module and to use almost all the hollow fibers mounted in the module for effective filtration.

Detailed Description Text (5):

The filtration type can be either a dead-end type filtration wherein the whole quantity of raw water supplied is recovered as filtrate, or a cross flow type filtration wherein a part of raw water supplied is recovered as concentrated water outside the membrane module system. Also, it may be either a pressurizing filtration type wherein raw water is pressurized from the outer surface side of the membrane by using a pump or the like to obtain filtrate, or a decompressing filtration type wherein a membrane module is submerged in a raw water tank or a raw water pit and the inner surface side of membrane is decompressed to obtain filtrate. The pressurizing filtration type is preferred because a higher filtration flux can be obtained.

Detailed Description Text (68):
According to the purifying method of the present invention, it is possible to prevent damage of the membrane surface by fine particles at the time of treating the aqueous suspension containing fine particles comprising an inorganic material with the membrane and to stably perform a filtration over a long term. Accordingly, the present invention is suitable for the field of purifying the aqueous suspension containing an inorganic material, e.g., tap water such as river water, lake water, marsh water and groundwater; water for industrial uses; waste water; secondary treatment waste water; industrial sewage; domestic sewage; human waste; sea water and the like. In addition, the hollow fiber membrane module of the present invention has an advantage of less scrubbing and damage to the membranes due to bulky waved hollow fiber membranes having a large diameter. Therefore, it can be suitably used for the purifying method of the present invention. The module also has excellent discharge efficiency of suspended solids. Further, the hollow fiber membrane of the present invention is suitable for a large-scale module which has fewer defects in the bonded portion at the edge of membrane.

Detailed Description Text (170):
The filtration was conducted according to a dead-end type one under constant pressure, i.e., a trans-membrane pressure of 30 kPa, in which the raw water (11) was supplied to the hollow fiber membrane module (14) and concentrated water was not discharged except for discharge of ozone-containing air. At the time of back wash, a back wash pressure was 50 kPa.